Before the
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

In the Matter of	)	
	)	
Expanding the Economic and	)	GN Docket No. 12-268
Innovation Opportunities of Spectrum	)	
Through Incentive Auctions	)	
	)	

REPLY COMMENTS OF FREE PRESS

Free Press respectfully submits this reply to initial comments filed in response to the *Public Notice*[1] seeking input on proposed 600 MHz band plans. At this time, Free Press does not endorse any single band plan put forth by the Commission or various commenters. Instead, we encourage the Commission to pursue the policy goals outlined in the statutes authorizing the incentive auction, and to remain steadfast in safeguarding the public interest. That means striking the right balance to maximize the usable spectrum available for competitive providers and innovative services, rather than promoting the narrow interests of any incumbents or industry sectors in this complex proceeding. Specifically, the Commission should preserve at least 20 megahertz of contiguous spectrum for unlicensed use in the reallocated 600 MHz band. The Commission also should study potential interference concerns and anticompetitive outcomes as it considers band plans that call for market variation, even if some variation may be inevitable or even desirable if carefully designed. Allowing these principles to guide its decision-making will promote innovation, expand connectivity, and spur economic growth as the Commission shapes the wireless broadband and broadcast landscape of the future.

[1] Wireless Telecommunications Bureau Seeks To Supplement the Record on the 600 MHz Band Plan, *Public Notice,* GN Docket No. 12-268, DA 13-1157 (rel. May 17, 2013) ("*Public Notice*").

I. Regardless of the Band Plan it Adopts, the Commission Should Set Aside a Guard Band or Duplex Gap with a Contiguous 20 Megahertz for Unlicensed Use in Every Market.

The Commission's choice of band plan for the upcoming incentive auction, and the associated auction design and service rules for licenses secured through that auction, will have significant and long-lasting consequences for incumbent broadcasters, mobile network operators, and companies and individuals desiring to make unlicensed use of sub-1GHz frequencies. Free Press does not in this reply endorse any single band plan variation proposed by the Commission or various commenters. Rather, we urge the Commission to adopt a band plan that maximizes the public benefit, minimizes interference, and supports the most intensive use of spectrum. To that end, the Commission should make available at the very least a contiguous 20 megahertz guard band or duplex gap for unlicensed use within the 600 MHz band frequencies not exclusively assigned to a primary license holder. This would best balance the needs and requirements of broadcasters, new license holders, and users of unlicensed devices and applications.[2]

As articulated in our initial comments on the Noticed of Proposed Rulemaking ("*NPRM*") in this proceeding, the Spectrum Act grants the Commission clear authority to set aside guard bands for unlicensed use.[3] Specifically, the Spectrum Act authorizes the Commission to employ "relinquished or other spectrum to implement band plans with guard bands" and to "permit the use of such guard bands for unlicensed use."[4] Furthermore, this authority extends to any duplex gap adopted, as a duplex gap may serve as a type of guard band as well.[5]

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[2] *See, e.g.,* In the Matter of Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, *Notice of Proposed Rulemaking,* GN Docket No. 12-268, 27 FCC Rcd 12357, ¶¶ 126, 151-52, 234 (2012) ("*NPRM*").

[3] *See* Comments of Free Press, GN Docket No. 12-268, at 3-7 (filed Jan. 25, 2013) ("Free Press Comments"); Comments of the National Cable & Telecommunications Association, GN Docket No. 12-268, at 3-4 (filed June 14, 2013) ("NCTA Band Plan Comments").

[4] *See* Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, § 6407(a), (c), 126 Stat. 156, 231-32 (2012) ("Spectrum Act").

[5] A guard band "prevent[s] harmful interference between licensed services outside the guard bands." *Id.* § 6407(b).

It would be a reasonable exercise of the Commission's discretion to set aside guard bands, including any duplex gap, for unlicensed use. The Spectrum Act directs the Commission to balance the spectrum needs of broadcast, licensed mobile broadband, and unlicensed uses.[6] Setting aside guard bands for unlicensed use properly would maximize the significant public interest benefits that flow from open spectrum, namely, innovation and economic growth.

As originally envisioned,[7] incentive auctions could benefit both broadcasters and mobile operators by matching valuable spectrum allocations to evolving technology and consumer demand. However, new technologies have been developed that allow unlicensed users to similarly and simultaneously benefit from access to valuable sub-1 GHz spectrum bands. As Free Press,[8] other public interest organizations,[9] companies offering services that use unlicensed spectrum,[10] and researchers[11] have noted, unlicensed spectrum provides enormous benefits to the U.S. and global economies. Unlicensed spectrum supports vast amounts of data exchange; encourages innovation; promotes broadband access without sole reliance on licensed carriers and other gatekeepers; reduces barriers to entry; and makes licensed spectrum more valuable by

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A duplex gap is a type of guard band because it is the "required separation between uplink and downlink bands" to prevent interference between these licensed frequencies. *NPRM* ¶ 166; *see also* Comments of Comcast Corporation and NBCUniversal Media, LLC, GN Docket No. 12-268, at 44 (filed Jan. 25, 2013) ("Comcast Comments") ("This flexibility [of adopting technically reasonable guard bands] necessarily extends to the Commission's considerations regarding the duplex gap between the uplink and downlink frequencies, as the duplex gap serves as a type of guard band."); Comments of Google Inc. and Microsoft Corporation, GN Docket No. 12-268, at 34-36 (filed Jan. 25, 2013) ("Google/Microsoft Comments") (asserting that the determination of duplex gap size is subject to technical reasonableness standard because the duplex gap, like a guard band, protects against interference).

[6] *NPRM* ¶¶ 126, 151-52, 234.

[7] See Federal Communications Commission, Connecting America: The National Broadband Plan at xii, 75-76, 81-82 (2010).

[8] Free Press Comments at 7-13.

[9] *See, e.g.,* Comments of Public Interest Spectrum Coalition, GN Docket No. 12-268, at 8-21 (filed Jan. 25, 2013); Comments of the Consumer Federation of America, GN Docket No. 12-268, at 5 (filed Jan. 25, 2013) (citing Mark Cooper, "Efficiency Gains and Consumer Benefits of Unlicensed Access to the Public Airwaves" (2012)).

[10] *See, e.g.,* Google/Microsoft Comments at 2-28; Comments of the National Cable & Telecommunications Association, GN Docket No. 12-268, at 2 (filed Jan. 25, 2013).

[11] *See, e.g.,* Simon Forge, Robert Horvitz, & Colin Blackman, "Perspectives on the Value of Shared Spectrum Access: Final Report for the European Commission (2012); Richard Thanki, "The Economic Value Generated By Current And Future Allocations Of Unlicensed Spectrum," Final Report (Sept. 2009); Yochai Benkler, "Open Wireless vs. Licensed Spectrum: Evidence from Market Adoption," 26 *Harv. J.L. & Tech* 69 (2012).

allowing carriers and their customers to offload traffic onto Wi-Fi networks. However, in part because of this track record of success, current unlicensed bands are facing significant congestion and interference in more densely populated areas.[12] Additionally, signals in most bands currently open to unlicensed use often propagate short distances due to environmental obstacles and transmission power restrictions, limiting the range of services and applications that can be successfully deployed. TV band spectrum is attractive for unlicensed use precisely for the same reasons it is for mobile network operators: its "beachfront" spectrum properties of traveling long distances and penetrating building walls and other obstacles.[13]

In order to realize these benefits in the 600 MHz band, it is paramount that the Commission set aside as much contiguous spectrum as possible—ideally, at least 20 megahertz--to make it usable for robust unlicensed operations. Both the National Cable Television Association ("NCTA") and the Wireless Internet Service Providers Association ("WISPA") stressed the need for sufficient contiguous spectrum in their initial band plan comments responding to the *Public Notice*. NCTA suggested that multiple, fragmented guard bands may not yield sufficient usable unlicensed spectrum, even if superficially the total megahertz in separate segments added together were greater than the amount in a single guard band or gap.[14] Similarly, WISPA points out that contiguous blocks of spectrum will lead to increased capacity

[12] *E.g.*, Mass Consultants Limited, "Estimating the Utilisation of Key Licence-Exempt Spectrum Bands: Final Report" (April 15, 2013) (noting congestion and interference on the 2.4 GHz unlicensed band in central London).
[13] *See, e.g.,* Richard Thanki, "The Economic Significance of Licence-Exempt Spectrum to the Future of the Internet," at 11-12 (2012); *see also id.* at 68-72, noting that 26 megahertz of 900 MHz band unlicensed spectrum "possessing excellent sub-1GHz propagation characteristics" and low component costs has facilitated the deployment of wireless smart grid technologies in the United States. Restrictions and spectrum fragmentation in these bands in Europe, on the other hand, have delayed smart grid deployment at an estimated annual loss in net present value for each year of delay of $76 to $120 billion.
[14] *See* NCTA Band Plan Comments at 5 ("[A] contiguous block of spectrum will allow for a greater range of unlicensed devices, higher throughput, advanced techniques for managing out-of-band emissions and the potential for a common 'control channel' across markets.").

and coverage for broadband users.[15] It notes that without a large contiguous band of unlicensed spectrum, "WISPs will not be able to build a business case that would allow them to purchase equipment and deploy broadband services in the TV band," which "would sharply limit the amount that equipment manufacturers will invest in developing new technologies and new equipment, a blow from which the burgeoning white space economy might never recover."[16]

In the *NPRM*, the Commission recognized an inherent tradeoff in setting the size of the duplex gap. The Commission noted that "minimizing the duplex gap size would increase the amount of spectrum available for licensing but could have a negative impact on mobile performance. A wider duplex gap, conversely, could enhance mobile performance [17] Furthermore, "in the 3GPP standards for LTE, the smallest duplex gap in absolute terms is Band 8 (880-915 MHz and 925-960 MHz bands) at 10 megahertz, and the smallest gap in relative terms is Band 25 (1850-1915 MHz and 1930-1995 MHz bands (extended PCS including the G block)) at 23 percent of the pass band. However, these bands have degraded reference sensitivities."[18] For these reasons, although some parties propose a duplex gap between 10 and 14 megahertz in size,[19] sound engineering suggests that a duplex gap of at least 20 megahertz would serve as a technically reasonable method of protecting against interference.[20] It is also much easier to create a large duplex gap, and allow unlicensed operations within it to make productive use of those frequencies, than it is to retroactively manage harmful interference

[15] Comments of The Wireless Internet Service Providers Association, GN Docket No. 12-268, at 2 (filed June 14, 2013).
[16] *Id.* at 6.
[17] *NPRM* ¶ 178.
[18] *Id.* ¶ 178 n.262.
[19] Comments of AT&T Inc., GN Docket No. 12-268, at 34 (filed Jan. 25, 2013) ("[T]he size of an ideal duplex gap would likely range from ten to fourteen megahertz, depending on a number of factors"); Comments of CTIA – The Wireless Association GN Docket No. 12-268, at 28 (filed Jan. 25, 2013) ("at least 10 MHz, and possibly more"); Comments of T-Mobile USA, Inc., GN Docket No. 12-268, at 10 (filed Jan. 25, 2013) (10 megahertz); Comments of Verizon and Verizon Wireless, GN Docket No. 12-268, at 18 (filed Jan. 25, 2013) ("The gap must be at least 10 MHz (and possibly larger, depending on overall band design).").
[20] Comcast Comments at 44-46 (supporting a duplex gap of at least 20 megahertz); Google/Microsoft Comments at 37-39 (supporting a duplex gap of 28 megahertz).

between licensed services after spectrum has already been assigned—especially if such interference is greater than expected or if unanticipated sources of interference are discovered. Furthermore, a larger duplex gap greatly expands the utility of white space devices by harmonizing with current Wi-Fi technologies, which make use of 20 megahertz channels,[21] and allowing for the implementation of more robust spread-spectrum technologies.

Free Press acknowledges that adopting a TDD band plan, instead of FDD, might offer significant advantages given the uncertainty inherent in this proceeding. Notably, TDD plans offer more flexibility in responding to geographic variations in the amount of reclaimed spectrum, since TDD technology does not require separate uplink and downlink blocks and can scale in response to available spectrum.[22] TDD plans also offer more flexibility to respond to asymmetries in downlink and uplink; and current mobile broadband systems are typically dominated by downstream traffic.[23] Moreover, some commenters argue that TDD plans for 600 MHz spectrum are more likely to be adopted internationally, creating better global harmonization opportunities than a supplemental downlink-focused approach.[24] Whether adopting FDD or TDD, however, Free Press submits that the band plan should maximize the size of the largest gap or guard band available for unlicensed use. In a TDD band plan, the Commission should place a guard band of at least 20 megahertz between mobile and television operations, as anything less would diminish the economic benefits from unlicensed use in the 600 MHz band—including in geographic markets that now have many unused TV channels.

[21] Comcast Comments at 41-42.
[22] Comments of Sprint Nextel Corporation, GN Docket No. 12-268, at 10-11 (filed June 14, 2013) ("Sprint Band Plan Comments"); Supplemental Comments of Cellular South, Inc., GN Docket No. 12-268, at 7 (filed June 14, 2013) ("C Spire Band Plan Comments").
[23] *See* C Spire Band Plan Comments at 2.
[24] Sprint Band Plan Comments at 16-17.

II. The Commission Should Approach Variable Band Plans with Caution, As They Have the Potential to Create Auctioned Spectrum Blocks Attractive Only to the Two Largest Bidders while Diminishing White Spaces in the Reconstituted TV Band.

Free Press contends that the public interest would best be served by a band plan that is as uniform and contiguous as possible, but we recognize that some market variability may be inevitable.[25] The Commission has expressed concern that a uniform nationwide plan would be bound by the most "constrained" market that clears the least amount of spectrum. In such cases, it is possible that there could be insufficient spectrum available at auction in some markets for multiple competitive providers to obtain any licenses, depending on how the Commission structures the forward auction and assesses bidders' current spectrum holdings.

Still, we caution the Commission that market-to-market variability in the band plan could—if poorly implemented— present at least three challenges: 1) Variability could take away open spectrum for unlicensed use in remaining TV white spaces; 2) It could yield unpredictable results, because there is uncertainty as to which markets will be "constrained" before running the reverse auction; and 3) Variability could itself decrease the competitive benefits of the auction if it produces significant asymmetry or a significant number of unpaired downlink blocks.

First, on a basic level, unrestrained market variability could mean clearing as much spectrum as possible in each economic area ("EA"). Maximizing the amount of licensed spectrum available for mobile broadband could raise revenue for the U.S. Treasury and for public safety—though even that contention is uncertain, because making *too much* spectrum available could dilute demand and decrease bid prices overall. And even with strong demand for all of the spectrum available at auction, revenue could decrease if all but two carriers were dissuaded from participating. In any of these cases, maximizing licensed spectrum would come at the expense of open spectrum for unlicensed use in remaining TV white spaces.

[25] Ruth Milkman, "A Band Plan that Serves the Public Interest," Official FCC Blog, June 21, 2013.

Second, it is unclear *a priori* what markets will be most constrained with respect to clearing. Some television markets may suffer from technical constraints due to interference concerns between adjacent markets and harmonization issues with Canadian and Mexican television stations. However, heavily urbanized markets such as New York City might be even *more* constrained for economic reasons, as these areas also offer the most lucrative television markets due to potential audience size and income. To the extent that spectrum congestion is a problem chiefly in these most densely populated areas, market variation may do little to increase supply for mobile wireless operations. In fact, a band plan designed to permit more market variation might yield fewer nationwide paired spectrum blocks. For example, a "down from 51 reversed" band plan, by requiring an additional guard band between the 700 MHz uplink block and the new 600 MHz downlink block,[26] would reduce spectrum available at auction while fragmenting the guard band spectrum available for unlicensed use.[27]

Third, while conventional wisdom may suggest market variability would lead to more competition by providing more spectrum on which stakeholders might bid, that notion likely will not hold true in the incentive auction context. A variable band plan could leave "inordinate" amounts of unpaired downlink spectrum in less constrained markets; and only the two largest carriers, which already have substantial low-band spectrum, might be able to make use of that spectrum.[28] Consequently, providing additional downlink spectrum in some markets will likely further exacerbate the current spectrum imbalance and perhaps even reduce revenue as competitive carriers without sufficient low band spectrum sit out the auction.[29]

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[26] *Public Notice* at 3-4.
[27] *See* NCTA Band Plan Comments at 4-5.
[28] *See* C Spire Band Plan Comments at 6; Sprint Band Plan Comments at 8 ("Such an approach would unnecessarily sacrifice the utility – and thus desirability and availability of this spectrum – for operators that do not already have low-band spectrum….[I]t would create a significant number of unpaired downlink spectrum blocks that would be of very limited use to anyone except AT&T and Verizon.").
[29] *See* Sprint Band Plan Comments at 9.

Finally, as noted by NAB and AT&T, market variability poses the risk of co-channel interference between television broadcasters and wireless carriers.[30] NAB characterizes this potential interferences as "one of the most critical unresolved elements of the 600 MHz band plan."[31] A preliminary analysis by AT&T "suggests that separation distances between TV transmitters and wireless base station receivers would generally need to be in the range of more than 200 kilometers in order to avoid harmful co-channel interference to mobile base station receivers" which "would seem to indicate that it could be difficult to tolerate variations in the amount of spectrum offered at auction on an EA-by-EA basis."[32]

Respectfully Submitted,

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[30] Comments of the National Association of Broadcasters, GN Docket No. 12-268, at 4 (filed June 14, 2013) ("NAB Band Plan Comments"); Comments of AT&T Inc., GN Docket No. 12-268, at 5 (filed June 14, 2013) ("AT&T Band Plan Comments").
[31] NAB Band Plan Comments at 2.
[32] *See* AT&T Band Plan Comments at 5.